A2

Gu et al., and 5,841,328 to Hayashi, all incorporated herein by reference. However, using spiral-like configurations for couplers based on these technologies have certain limitations, as described below.--

~~Please replace the paragraph beginning at page 3, line 26 with the following rewritten~~ paragraph:

A3

-- Hard ceramic materials may provide dielectric constants higher than approximately 10.2, but components utilizing these materials cannot be miniaturized in a stand-alone multilayer realization. For example, bond wire interconnects must be used for the realization of microstrip circuitry, increasing the overall size of the resulting microwave devices. Other ceramic materials have limited dielectric constants, typically approximately 2 to 4, which prevent close placement of metalized structures and tend to be unreliable for small, tight-fitting components operating at microwave frequencies. Additionally, ceramic devices operating at microwave frequencies may be sensitive to manufacturing limitations and affect yields. LTCC Green Tape materials tend to shrink during processing, causing mismatches preventing manufacturers from making smaller coupling lines and placing coupling lines too closely lest they lose their spacing due to shifting during processing. For these reasons, spiral-like configurations of couplers cannot be too compact and the benefits of using spirals are limited.--

~~Please replace the paragraph beginning at page 5, line 19 with the following rewritten paragraph.~~

A4 sub B1

-- The present invention relates to spiral-like couplers and the manufacture of spiral-like couplers using PTFE as a base material. Coupling lines are wound in spiral-like shapes, which can be rectangular, oval, circular, or other shape that provides a compact structure in nature. Couplers can consist of two, three, or more coupling lines, depending on the application and desired coupling. Coupling lines can be co-planar, taking up only one layer of metalization between two layers of dielectric material, or they can be stacked in two or more layers, depending upon the number of lines being utilized.--

Please replace the paragraphs beginning at page 8, line 12 and continuing to page 9, line 8 with the ~~following rewritten paragraphs:~~

A5

--Fig. 19a is a top view of the fourth layer of the spiral coupler package of Fig. 3.

Fig. 19b is a bottom view of the fourth layer of the spiral coupler package of Fig. 3.

Fig. 19c is a side view of the fourth layer of the spiral coupler package of Fig. 3.

Fig. 20a is a top view of the third layer of the spiral coupler package of Fig. 3.

Fig. 20b is a bottom view of the third layer of the spiral coupler package of Fig. 3.

Fig. 20c is a side view of the third layer of the spiral coupler package of Fig. 3.

Fig. 21a is a top view of the second layer of the spiral coupler package of Fig. 3.

Fig. 21b is a bottom view of the second layer of the spiral coupler package of Fig. 3.

Fig. 21c is a side view of the second layer of the spiral coupler package of Fig. 3.

Fig. 22a is a top view of the first layer of the spiral coupler package of Fig. 3.

Fig. 22b is a bottom view of the first layer of the spiral coupler package of Fig. 3.

Fig. 22c is a side view of the first layer of the spiral coupler package of Fig. 3.--

Please replace the paragraph beginning at page 15, line 12 with the following rewritten paragraph:

--In a preferred embodiment, four fluoropolymer composite substrate panels, such as panel 2300 shown in Fig. 23, typically 9 inches by 12 inches, are mounted drilled with a rectangular or triangular alignment hole pattern. For example, alignment holes 2310, each of which has a diameter of 0.125 inches in a preferred embodiment, are drilled in the pattern shown in Fig. 23. Alignment holes 2310 are used to align panel 2300, or a stack of panels 2300.--

Please replace the paragraph beginning at page 16, line 16 with the following rewritten paragraph:

--Panel 2302 is further processed as follows. Panel 2302 is plasma or sodium etched, then cleaned by rinsing in alcohol for 15 to 30 minutes, then preferably rinsing in water, preferably deionized, having a temperature of 21 to 52 degrees C for at least 15 minutes. Panel 2302 is then vacuum baked for approximately 30 minutes to 2 hours at approximately 90 to 180 degrees C, but preferably for one hour at 149 degrees C. Panel 2302 is plated with copper, preferably first using an electroless method followed by an electrolytic method, to a thickness of approximately 13 to 25 microns. Panel 2302 is preferably rinsed in water, preferably deionized, for at least 1 minute. Panel 2302 is heated to a temperature of approximately 90 to 125 degrees C for approximately 5 to 30 minutes, but preferably 90 degrees C for 5 minutes, and then laminated with photoresist. Masks are used and the photoresist is developed using the proper exposure settings to create the pattern shown in Figs. 26A and 26B (shown in greater detail in Fig. 21A, where in a preferred embodiment rings having an inner diameter of approximately 0.013 inches and an outer diameter of at least 0.015 inches are etched out of the copper, and Fig. 21B). These patterns also preferably include at least six targets 2326 on either side of panel 2302. The targets 2326 can be used for drill alignment for

future processing steps, and in a preferred embodiment comprise 0.040 inch annular rings around 0.020 inch etched circles. Both the top side and the bottom side of panel 2302 are copper etched. Panel 2302 is cleaned by rinsing in alcohol for 15 to 30 minutes, then preferably rinsing in water, preferably deionized, having a temperature of 21 to 52 degrees C for at least 15 minutes. Panel 2302 is then vacuum baked for approximately 30 minutes to 2 hours at approximately 90 to 180 degrees C, but preferably for one hour at 149 degrees C.--

~~Please replace the paragraph beginning at page 17, line 21 with the following rewritten paragraph:~~

--Panel 2303 is further processed as follows. Panel 2303 is plasma or sodium etched, then cleaned by rinsing in alcohol for 15 to 30 minutes, then preferably rinsing in water, preferably deionized, having a temperature of 21 to 52 degrees C for at least 15 minutes. Panel 2303 is then vacuum baked for approximately 30 minutes to 2 hours at approximately 90 to 180 degrees C, but preferably for one hour at 149 degrees C. Panel 2303 is plated with copper, preferably first using an electroless method followed by an electrolytic method, to a thickness of approximately 13 to 25 microns. Panel 2303 is preferably rinsed in water, preferably deionized, for at least 1 minute. Panel 2303 is heated to a temperature of approximately 90 to 125 degrees C for approximately 5 to 30 minutes, but preferably 90 degrees C for 5 minutes, and then laminated with photoresist. Masks are used and the photoresist is developed using the proper exposure settings to create the pattern shown in Figs. 27A and 27B (shown in greater detail in Figs. 20A and 20B). These patterns also preferably include at least six targets 2326 on either side of panel 2303. The targets 2326 can be used for drill alignment for future processing steps, and in a preferred embodiment comprise 0.040 inch annular rings around 0.020 inch etched circles. Both the top side and the bottom side of panel 2303 are copper etched. Panel 2303 is cleaned by rinsing in alcohol for 15 to 30 minutes, then preferably rinsing in water, preferably deionized, having a temperature of 21 to 52 degrees C for at least 15 minutes. Panel 2303 is then vacuum baked for approximately 30 minutes to 2 hours at approximately 90 to 180 degrees C, but preferably for one hour at 149 degrees C.--

~~Please replace the Paragraph beginning at page 18, line 23 with the following rewritten paragraph:~~

B4

--With the assistance of targets 2326 and alignment holes 2310, panels 2304, 2303, 2302, 2301 are stacked, aligned and fusion bonded into assembly 2800, in a preferred embodiment, at a pressure of 200 PSI, with a 40 minute ramp from room temperature to 240 degrees C, a 45 minute ramp to 375 degrees C, a 15 minutes dwell at 375 degrees C, and a 90 minute ramp to 35 degrees C.--